

## APPENDIX B

### PHYSICAL ASSESSMENT OF FOREST SERVICE REACHES

Prepared by Lolo National Forest

#### Physical Assessment – Channel Pattern

##### *Sinuosity*

Sinuosity is a dimensionless ratio of stream length over valley length, and provides a measure of a stream's degree of "meandering-ness." Sinuosity of our 2002 field sites was analyzed using a digital planimeter and 1:6000 aerial photos (1993) are included in the following table. Where a change in pattern (meander cutoffs) was detectable, sinuosity was calculated for the historic stream pattern as well (**Table B-1**). In these instances, sinuosity of the St. Regis River mainstem reaches has decreased overtime.

**Table B-1: Sinuosity of St. Regis River mainstem field sites, measured with a digital planimeter on 1:6000 scale 1993 aerial photos**

Reach No	Stream Length (ft)	Valley Length (ft)	Sinuosity	Change	Number of Cutoff Meanders	Road Encroachment or Other alteration*	Rosgen Stream Type	Target Sinuosity
9	1728	1446	1.20				C3b	> 1.2
1	1967	1879	1.05	- 0.01	1	yes	C3	> 1.2
	1988	1879	1.06					
11	2905	2879	1.01	- 0.24	3	yes	B3c	> 1.2
	3596	2879	1.25					
4	3367	3131	1.08			yes	C3/4	> 1.2
6	3750	3375	1.11	- 0.12	1	yes	B3c or F3	> 1.2
	4157	3375	1.23					
7	5043	4445	1.14			yes*	C3	> 1.2
7~	3145	2953	1.07				C3	> 1.2
7+	9376	7595	1.24				C3	> 1.2

\*Other alteration: diking, berming, straightening

~ 2000, 1: 15840 photos; valley type 2

+ 2000, 1: 15840 photos; valley type 8

#### Physical Assessment – Channel Materials

#### Introduction and Methods

Riffle stability index (RSI) is a relative measure of bedload sediment supply to stream transport capacity. The RSI index value is easily derived. A Wolman pebble count in a riffle is conducted and the intermediate axis of the 30 largest mobile particles located on a nearby point bar is measured. The geometric mean of the largest bar particles is calculated, and a cumulative percent-finer distribution of the riffle particles is plotted. The RSI value is the cumulative percent finer than value that corresponds with geometric mean of the 30 largest mobile bar particles.

Largest mobile bar particle measurements and riffle pebble counts were collect at 33 of the 46 stream sites (58 cross sections) surveyed during 2002 in the St. Regis watershed.

## Results and Discussion

Kappeser (2002) demonstrated that RSI values differ for B stream types in managed versus unmanaged watersheds. RSI values for 2002 stream surveys in the St. Regis watershed, including B and C streams types, also differ from managed versus unmanaged watersheds. If roads existed in the watershed above a stream survey, the watershed was considered managed. The highest RSI values ( $>75$ ) were found in managed watersheds. Intermediate RSI values (46-75) occurred in managed as well as unmanaged watersheds. RSI values less than 46, and in all St. Regis cases values less than 46 were equal to 0 meaning no point bars were found in the reach. These divisions are similar to those found by Kappeser, although by including both B and C stream types, it is expected for the index values between groups to be lower because of the greater vulnerability of the C channels.

What the results suggest is that there is more mobile bedload in streams of managed (sic roaded) watersheds. There is a greater sediment supply in these streams than the stream is able to equilibrate with its flow regime, therefore bar deposits are found on which particles are larger than the particles found in the riffles. If the stream is moving these larger particles, then the stream is also moving the smaller particles that comprise the riffle, thereby making the riffles less stable. Streams with small index values ( $<45$ , and in this case 0) are either supply limited and/or have a flow regime with increased energy that prevents particles from being deposited. These reaches tend to be those confined between a hillslope and a road or between two roads, and those that have been shortened by meander-cutoff.

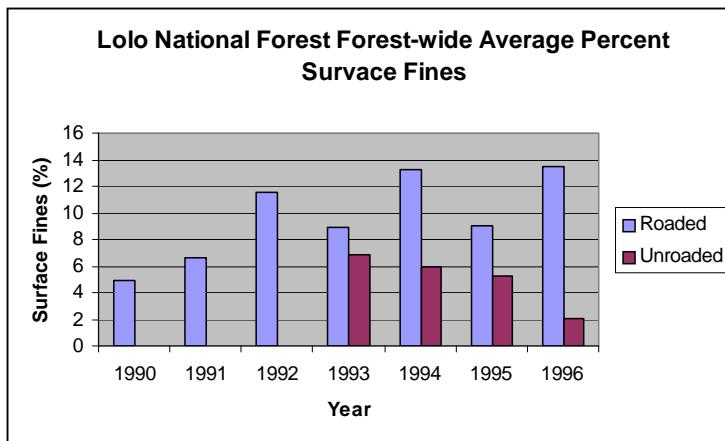
For the St. Regis mainstem, the managed depositional reaches we surveyed come in with high RSIs (Reach 7 near Little Joe confluence, Reach 4 at DeBorgia near Deer Creek confluence, and Reach 1 above Taft near Rainy Creek confluence, although two other samples in Reach 1 have intermediate RSI), St. Regis Reach 9, closest to the headwaters and in reference condition comes in with intermediate/low RSI (46-48), and the totally entrenched reaches smashed between the RR and I90 (Reaches 6&11) had no point bars so their RSI is 0 (**Table B-2**).

**Table B-2. Riffle Stability Index (RSI) Values**

Huc6	Tributary	Reach	Cross Section	Rsi	Managed	Stream Type	Potential Reference Reach
Little Joe Creek	Little Joe Creek	1		92	yes	C	
St. Regis River	St. Regis River	7	B	90	yes	C	
Twelvemile Creek	Twelvemile Creek	1		88	yes	C	
St. Regis River	St. Regis River	4	B	87	yes	C	
Big Creek	West Fork Big Creek	1a		85	yes	C	
Big Creek	Big Creek	3		85	yes	C	
Big Creek	West Fork Big Creek	1		82	yes	Bc	
Savenac Creek	Savenac Creek	1	B	80	yes	C	
Twelvemile Creek	Mineral Mountain Creek	1		78	yes	E	
Little Joe Creek	North Fork Little Joe Creek	1		78	yes	C	
Twelvemile Creek	Flat Rock Creek	1		76	yes	C	yes
Twelvemile Creek	Rock Creek	1		76	yes	B	
Little Joe Creek	North Fork Little Joe Creek	4		75	yes	Cb	
St. Regis River	St. Regis River	1	C	75	yes	C	
Savenac Creek	Savenac Creek	5		73	no	Cb	yes
Big Creek	Gilt Edge Creek	4		72	no	Ba	
St. Regis River	St. Regis River	1	B	71	yes	C	
St. Regis River	St. Regis River	1	A	64	yes	C	
Savenac Creek	Savenac Creek	1	A	63	yes	C	
Savenac Creek	Savenac Creek	4		63	no	B	yes
Little Joe Creek	South Fork Little Joe Creek	1		62	yes	Bc	
Twelvemile Creek	West Fork Twelvemile Creek	1		58	yes	Ba	
Twelvemile Creek	Rock Creek	2		58	yes	Cb	
Twelvemile Creek	Twelvemile Creek	2		57	yes	C	
Twelvemile Creek	East Fork Twelvemile Creek	1		56	yes	Cb	
Little Joe Creek	North Fork Little Joe Creek	1a		55	yes	Cb	
St. Regis River	St. Regis River	9	B	46	no	Cb	yes
Little Joe Creek	North Fork Little Joe Creek	2		0	yes	Cb	yes
St. Regis River	St. Regis River	11	A	0	yes	Bc	
St. Regis River	St. Regis River	6	A	0	yes	F	
Twelvemile Creek	Trapper Cabin Creek	1		0	yes	Ca	
Twelvemile Creek	Upper Rock Creek	1		0	yes	Ba	
Twelvemile Creek	Upper Rock Creek	2		0	yes	Ba	

## Physical Assessment – Percent Surface Fines

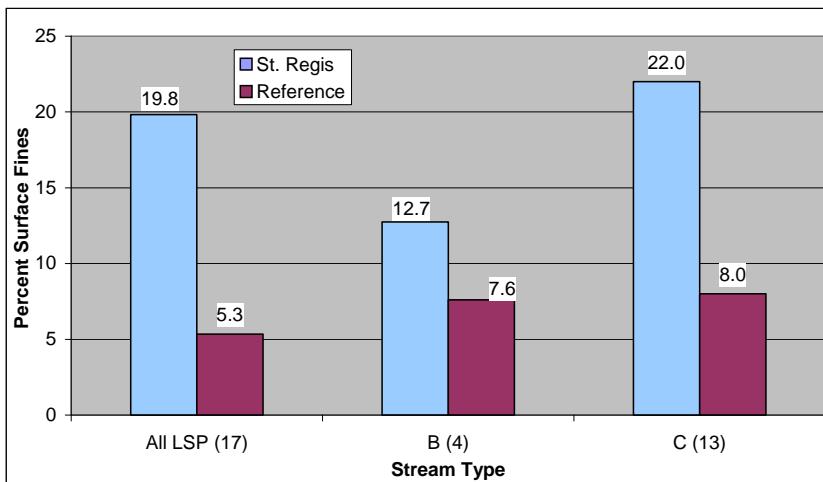
Riggers et al. (1998) described reference conditions for natural streams on the Lolo National Forest based on six years of data (1989-1995) collected on 69 streams (**Figure B-1**) using the 49-point grid-toss method. Percent surface fines <6.3 mm data collected in the St. Regis watershed included 17 lateral scour pools, 4 on B streams, and 13 on C streams, and 32 low gradient riffles, 8 on B streams and 24 on C streams. These data were compared to the reference conditions described by Riggers. Results and discussion follow.



**Figure B-1 Lolo National Forest Percent Surface Fines Data from 1994-1996 Monitoring Report**

#### *Lateral Scour Pools*

The combined PSF values by stream type for lateral scour pools exceed the proposed reference conditions for various habitat types (Figure B-2). C channels appear to have a greater departure from reference conditions than B channels. When specifically compared to the mean value of about 5.3% PSF for all lateral scour pools, the departures from reference are even greater.



**Figure B-2. Mean percent surface fines in lateral scour pools (LSP) by stream type**

All B channel PSF values are within the range of 0-20.9% (based on one standard deviation or 68% of reference sites if one were to assume a normal distribution). For reference C channels, this range is 0-16.5% (68% of reference sites) and 0-25.9% (95% of reference sites).

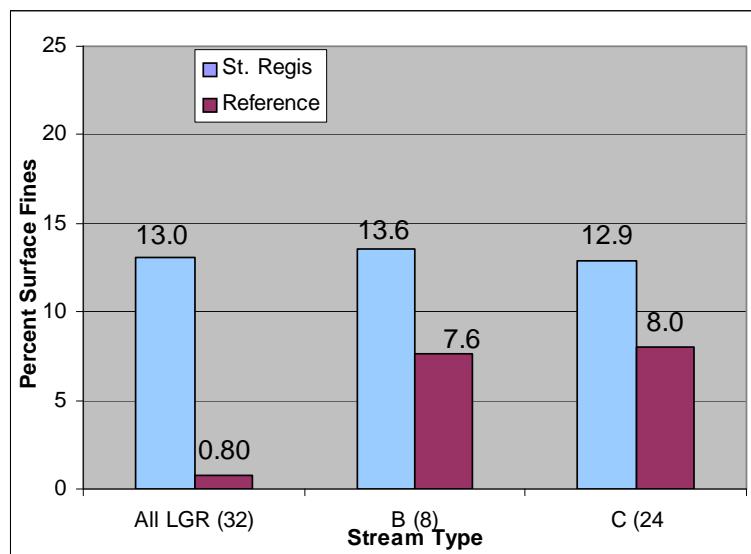
PSF values (Table B-3) in North Fork of Little Joe 1, Rock Creek of Twelvemile 2, Flat Rock Creek of Twelvemile, and Savenac Creek 1A all have very high PSF values in comparison to the expected range for natural C stream conditions.

**Table B-3. Percent surface fines for lateral scour pools**

Stream Name	Stream Type	Mean PSF	Compared to Reference
Big Creek 3	C	8.8	0.8
West Fork Big 1	Bc	8.2	0.6
West Fork Big 1A	C	0	-8
Gilt Edge	Ba	15	7.4
Little Joe Creek 1	C	4.1	-3.9
North Fork Little Joe 1	C	75.5	67.5
North Fork Little Joe 1A	Cb	14.3	6.3
North Fork Little Joe 2	Cb	4.1	-3.9
North Fork Little Joe 4	Cb	0	-8
Twelvemile Creek 1	C	4.1	-3.9
Rock 1	B	12.2	4.6
Rock 2	Cb	89.8	81.8
Flat Rock	C	26.5	18.5
Savenac Creek 4	B	15.6	8
Savenac 1A	C	43.5	35.5
Savenac 5	Cb	12.2	4.2
St. Regis River 1A	C	3.1	-4.9

### ***Low Gradient Riffles***

The combined PSF values by stream type for low gradient riffles exceed the proposed composite channel reference conditions. C and B channels appear to have approximately equal departures from reference conditions, B channels being slightly higher. When specifically compared to the mean value of about 0.8% PSF for all low gradient riffles, the departures from potential reference are even greater (**Figure B-3**).

**Figure B-3. Mean percent surface fines in low gradient riffles (LGR) by stream type**

Savenac Creek 4 and Breen Creek 1 both exceed the 68% range-maximum for B channels. Savenac Creek 1B, Savenac Creek 1A, Flat Rock Creek 1, Savenac Creek 5, and Rock Creek 2 exceed the 68% range-maximum for C channels (**Table B-3**). Surface fines in low gradient

riffles were higher than reference at Savenac Creek 1 and 4, Breen Creek 1, South Fork Little Joe Creek 1, Big Creek 3, St. Regis 1, North Fork Little Joe Creek 1A, Flat Rock Creek 1, East Fork Twelvemile Creek 1, and Rock Creek 2 sites (**Table B-4**).

**Table B-4. Percent surface fines for low gradient riffles**

Stream Name	Stream Type	Mean PSF	Compared to Reference
Savenac Creek 4	B	38.1	30.5
Rock Creek 1	B	7.5	-0.1
Gilt Edge Creek 4	Ba	7.5	-0.1
Breen Creek 1	Ba	21.8	14.2
West Fork Twelvemile Creek 1	Ba	4.1	-3.5
West Fork Big Creek 1	Bc	9.5	1.9
South Fork Little Joe Creek 1	Bc	17.3	9.7
St. Regis River 11A	Bc	2.7	-4.9
Big Creek 3	C	10.2	2.2
West Fork Big Creek 1A	C	9.5	1.5
Little Joe Creek 1	C	2.7	-5.3
North Fork Little Joe Creek 1	C	5.1	-2.9
Savenac Creek 1B	C	59.9	51.9
Savenac Creek 1A	C	61.2	53.2
St. Regis River 1B	C	12.2	4.2
St. Regis River 4A	C	8.8	0.8
St. Regis River 4B	C	0.7	-7.3
St. Regis River 4C	C	2.0	-6.0
St. Regis River 7A	C	0.7	-7.3
St. Regis River 7B	C	2.0	-6.0
Flat Rock Creek 1	C	21.8	13.8
Twelvemile Creek 1	C	6.8	-1.2
Twelvemile Creek 2	C	6.8	-1.2
Trapper Cabin Creek 1	Ca	10.2	2.2
North Fork Little Joe Creek 1A	Cb	12.2	4.2
North Fork Little Joe Creek 2	Cb	2.6	-5.4
North Fork Little Joe Creek 4	Cb	2.0	-6.0
Savenac Creek 5	Cb	19.7	11.7
St. Regis River 9A	Cb	6.1	-1.9
St. Regis River 9B	Cb	10.9	2.9
East Fork Twelvemile Creek 1	Cb	14.3	6.3
Rock Creek 2	Cb	20.4	12.4